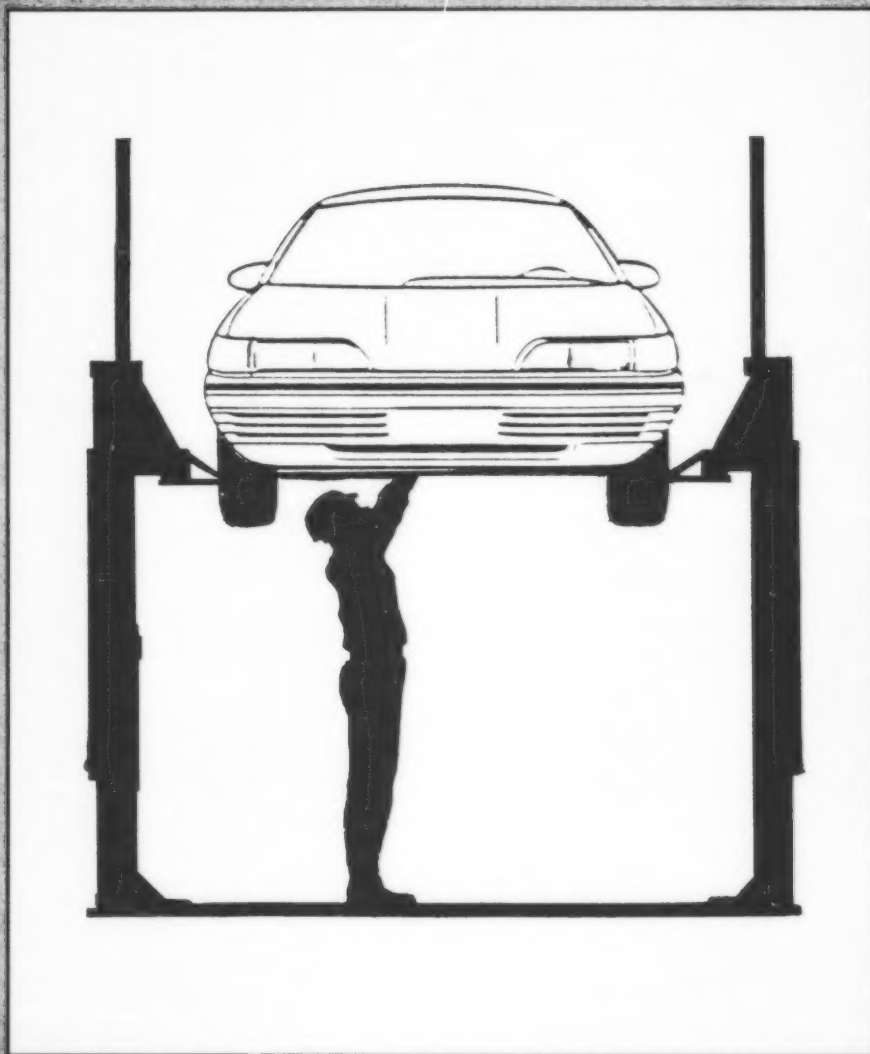
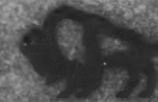
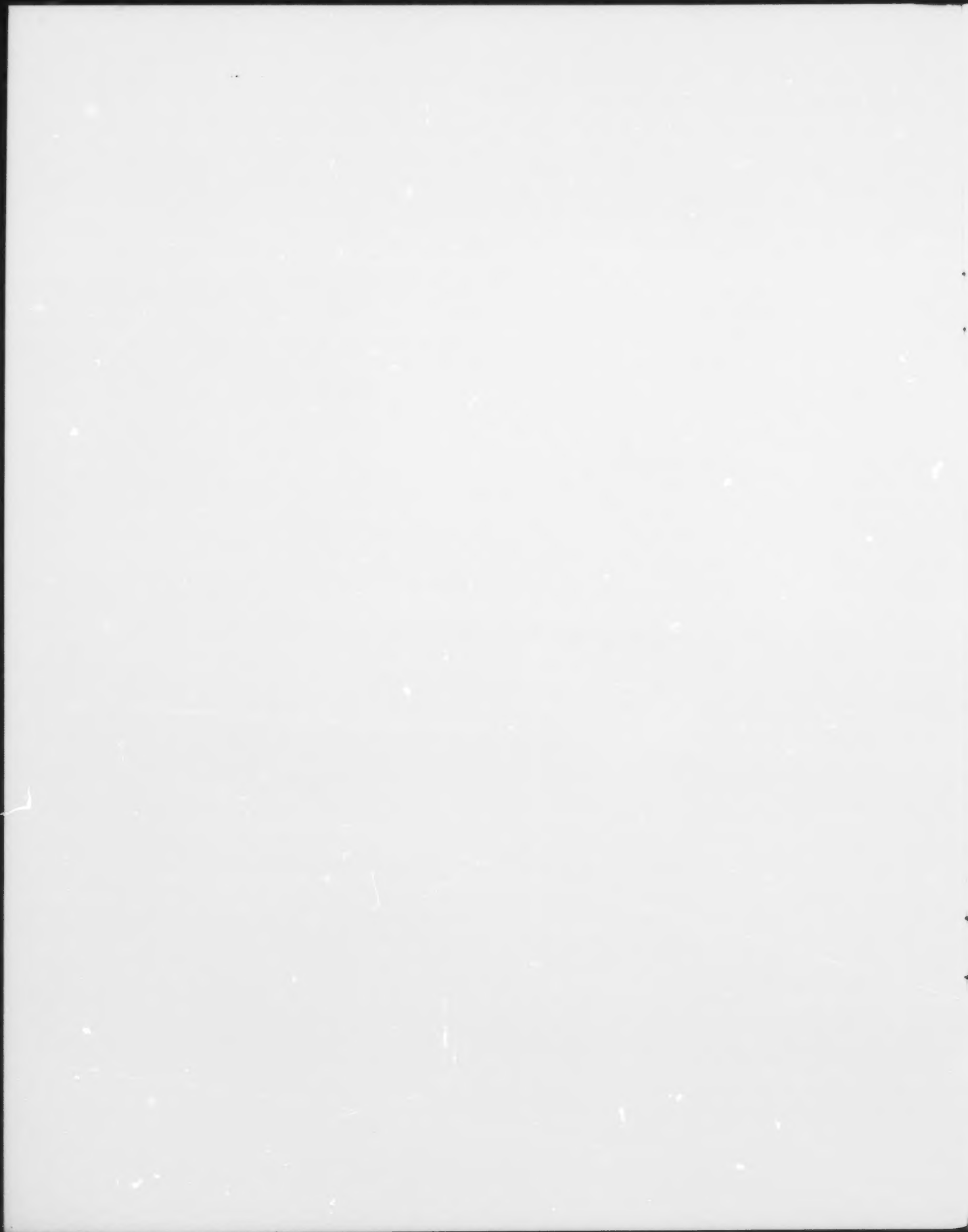


Guidelines for Automotive Lifts



SAFETY
FIRST





92-01257/

GUIDELINES FOR AUTOMOTIVE LIFTS

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AUGUST 1991



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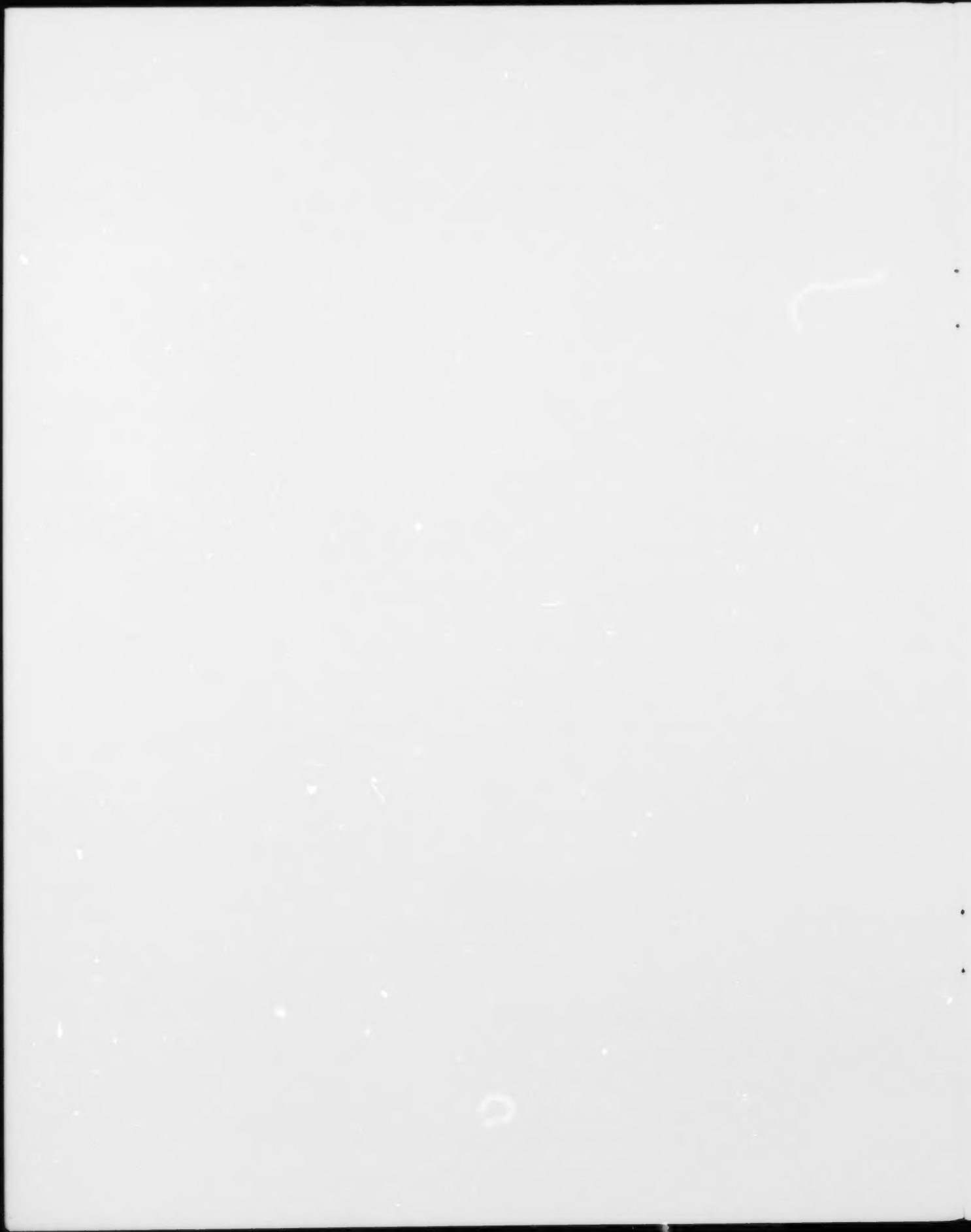


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INTRODUCTION

A variety of vehicle lifts are used throughout the automotive industry. This guideline will discuss the in-ground and surface-mounted lifts that are most commonly used types in Manitoba.

This guideline contains general information and minimum requirements for the safe operation of automotive lifts. It is intended to reflect and support health and safety training programs for people involved in the automotive industry. It is not a complete presentation of all safety problems and solutions related to automotive lifts.

Safe vehicle lifting requires a consistent safety and health program, regular maintenance and worker training. These are the responsibility of the employer. It is the employer's duty to see that no one operates or maintains a lift without proper training.

For the regulatory requirements pertaining to automotive lift and hoist safety, consult the regulations adopted under The Workplace Safety and Health Act W210 and ANSI Standard B153.1 - Safety Requirements for the Construction, Care and Use of Automotive Lifts.

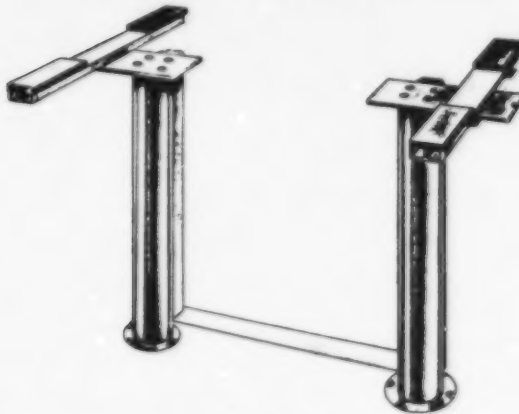
CLASSIFICATION OF AUTOMOTIVE LIFTS

IN-GROUND LIFTS

Lifts that have lifting assemblies situated below the garage floor are known as 'in-ground' lifts. These lifts use one or more pistons, depending on the type of vehicle and the weight to be lifted. For example, many one or two piston lifts are used to hoist standard compacts, mid-sized and full-sized passenger vehicles. Three or more piston lifts are used mostly on larger vehicles, such as transit coaches and fire engines.

In-ground lifts are powered in one of three ways:

- self-contained air/oil reservoir (semi-hydraulic)
- separate air/oil reservoir (full hydraulic)
- electric oil-pumping unit which supplies oil under pressure without the use of air pressure.

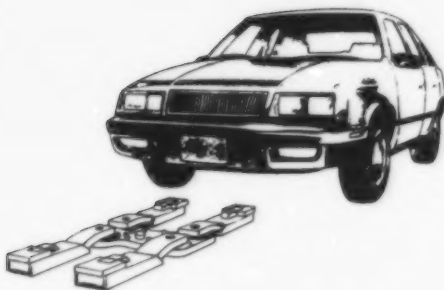


There is a wide variety of vehicle lifts used in the automotive industry

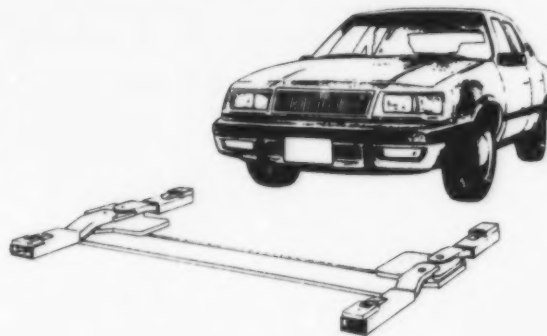
In-ground lifts are manufactured to conform to almost any type of vehicle.

Most **drive-through** lifts allow a vehicle to be driven between the lift arms, permitting easy access to the underside of the vehicle. The lift arms that elevate **drive-over** lifts are situated closer together. This type of lift lets the service worker drive over the lift without contacting the lift's components.

Lifts with pads that contact the vehicle's rocker panels or perimeter frame are generally used on passenger cars. These lifts allow unobstructed access to the underside of the car.



Drive-over type lift



Drive-through type lift

Lifts with two pistons, one at the front one at the back, [axle engaging] are used on vehicles that are equipped with a rear axle or support rail. Larger lifts of this type are also used on heavy-duty trucks, since these vehicles have a rear axle and differential.

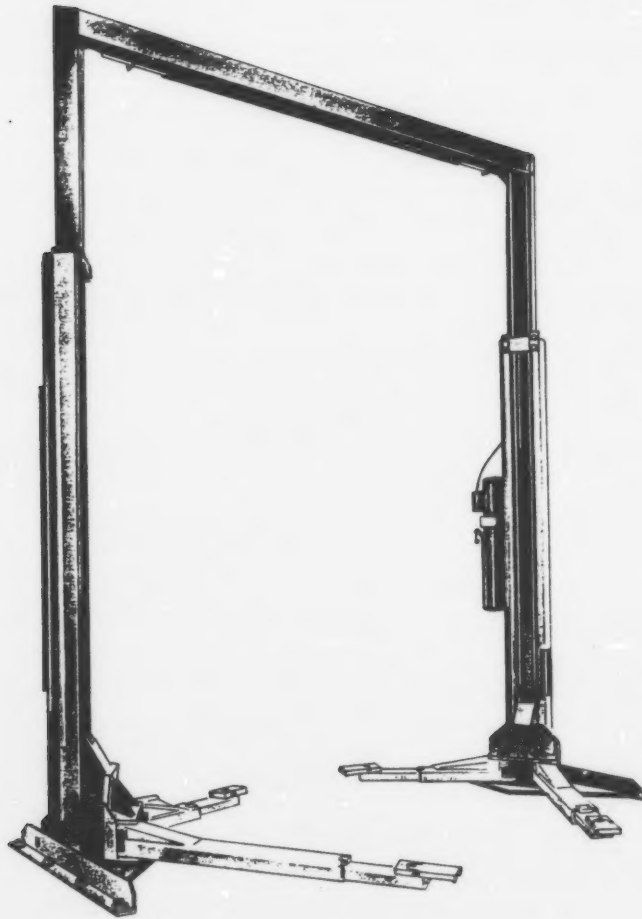
In many cases, the piston located near the front of the vehicle moves within its pit and is positioned beneath the front control arms or frame. The rear piston is fixed and is located beneath the rear axle.

SURFACE-MOUNTED LIFTS

Until about 1970, most lifts found in Manitoba's garages were in-ground lifts. Currently, surface-mounted lifts make up a larger part of the total automotive lifts in use.

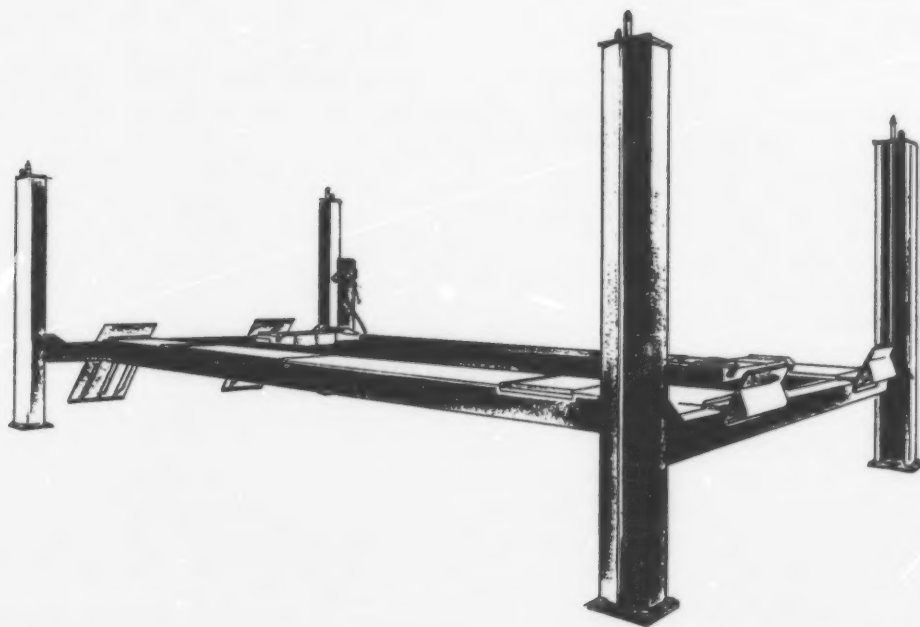
Surface-mounted lifts are bolted to the garage floor and are powered by an electric motor which operates either a hydraulic pump and cylinder(s) or a screw-type drive.

The most popular surface-mounted lift is the two-column drive-through frame-engaging lift. The lift arms ride up each column and are usually synchronized by a steel roller chain or cable assembly. Lifting power is provided by a hydraulic pump and cylinder(s), sometimes using leaf chain or cable systems. Screw lifts use rotating screw pillars that move the lift arms.



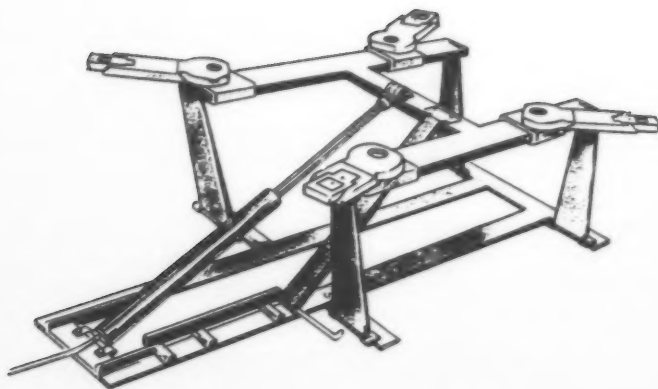
Surface-mounted lifts are bolted to the garage floor and are powered by an electric motor which operates either a hydraulic pump and cylinder(s) or a screw-type drive

The **four-column** surface-mounted lift is the primary lift of many muffler, oil change, wheel alignment and transmission shops. It allows the vehicle to be driven onto two runways and lifted by its tires, exposing the underside of the car.



Four-column surface-mounted lift

The **short-rise** service lift is also powered by an electric hydraulic power unit. The primary uses for this lift are tire and brake service and auto body repair. These lifts usually engage the vehicle's frame or rocker panels.



Short-rise service lift

WHAT TO DO BEFORE LIFTING

An automotive lift is **not** a crane. It is **not** a jack or a mechanical ladder. As implied by the name, vehicle lifts are engineered to hoist and support vehicles...and nothing else.

Automotive lifts must be operated by trained personnel only. If you don't know how to position or lift a vehicle properly, **do not operate the lift.**

Before driving a car or truck into the shop, be sure the lift area is free of:

- grease and oil
- tools
- cords and hoses
- trash and other debris

Customers and by-standers should not be in the lift area or in the vehicle while the lift is in use. These people are not familiar with the hazards in the shop and could be injured.

The lift should be fully lowered before driving the vehicle into the work bay. Be sure the lift's areas, adapters, and supports are positioned out of the way of the vehicle's tires before driving the vehicle into the bay.

LIFT CAPACITY

Never overload the lift. The manufacturer's rated load capacity is displayed on the nameplate attached to the lift. If the nameplate is missing, or the information is not readable due to wear, check immediately with the manufacturer's representative before using.

CENTER OF GRAVITY

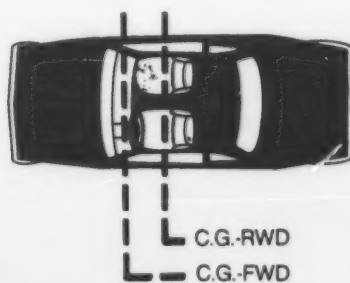
Before lifting any vehicle, know how to find its center of gravity. The center of gravity is the point between the front and rear of the vehicle where the weight is distributed equally.

Each vehicle has a different center of gravity, due to:

- weight distribution
- wheel base
- location of drive train
- and other factors

In most cases, the center of gravity on rear-wheel drive passenger cars is below the driver's seat. On front-wheel drive passenger cars, the center of gravity is slightly in front of the driver's seat.

Position the center of gravity in accordance with the lift manufacturer's spotting devices.



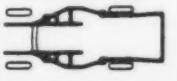
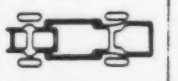
Centre of gravity for rear-wheel and front-wheel drive cars

LIFTING POINTS

Before lifting the vehicle, check the vehicle manufacturer's recommended lifting points. In most cases, these lifting points can be found in the vehicle's shop manual. The contact pads should be positioned only according to these specifications.

Check the condition of the vehicle's lifting surfaces. Are the vehicles's lifting points:

- damaged?
- rusted?
- covered with oil, dirt, undercoating, or anything else that may cause slippage?

Straight Frame 	Unitized Body 	Perimeter Frame 	X-Frame 
X-F Frame 		Volkswagon Position front adapters under front body pan. Position rear adapters under side jacking points.	

Before you lift the vehicle, check the vehicle manufacturer's recommended lifting points.

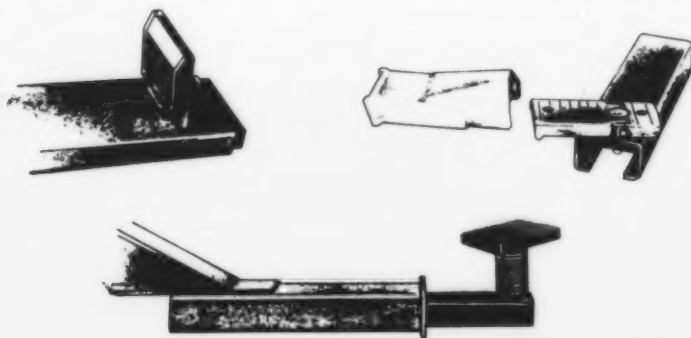
TYPES OF LIFTS

A. FRAME-ENGAGING LIFTS

Contact Pads

Frame-engaging lifts use flip-up or threaded contact (foot) pads that are located on the end of each of the lift arms. These contact pads are adjustable to several positions. Be sure the flip-up pads are securely in position before spotting them under the vehicle. If a pad is not secured, it could flip back down and cause the vehicle to become unstable.

Many lifts are equipped with rotating threaded contact pads that are adjustable to reach the vehicle. Before lifting the vehicle, be sure all four contact pads are adjusted properly. Be aware that screwing these pads out unevenly may make the load unstable. Check the lift manufacturer's recommendations for information on how to use this type of contact pad. If the lift uses contact pads with non-metallic coatings, the coatings should not be damaged or loose. If they are damaged, they should be replaced. Also, be aware that oil and grease can make these surfaces very slippery.



Before placing the lift arms under the vehicle, inspect each arm and contact pad for cracks or other signs of damage. **IF ANY PART OF THE LIFT IS DAMAGED OR OPERATING IMPROPERLY, DO NOT USE THE LIFT OR ATTEMPT TO FIX IT.** Notify your supervisor immediately. Qualified lift service personnel must do the repairs.

Extenders

Even though contact pads are adjustable to accommodate most vehicles, extenders may be necessary on vehicles such as pickup trucks and vans. These extenders are available from most lift manufacturers, so **don't use wood, concrete blocks, or other homemade extenders in their place.** Use only those extenders provided by the manufacturer of the lift.

Asymmetrical Lift Arms

Lifts whose front lift arms are different lengths than the rear arms are known as asymmetrical lifts. When using asymmetrical lift arms, always position the arms in accordance with the manufacturer's recommendations.

Centre of Gravity

The proper spotting points for vehicles on frame-engaging lifts vary, depending on the application:

- When hoisting with a single-piston in-ground lift, place the vehicle's center of gravity directly over the piston
- When using a two-piston in-ground lift, place the load's center of gravity on the center line between the two pistons

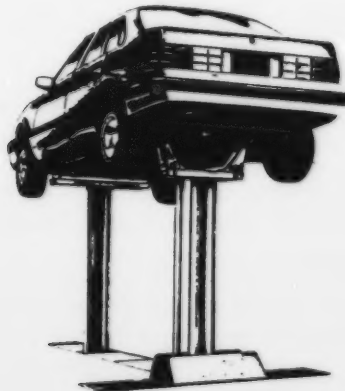
- When hoisting with a two-column drive-through surface-mounted lift, place the vehicle's center of gravity between the two columns
- If the lift is equipped with asymmetrical lift arms, check the manufacturer's specifications for spotting the vehicle's center of gravity

B. AXLE-ENGAGING LIFTS

The lift should be fully lowered before driving the vehicle into the work bay. Anything that strikes the pistons or posts could damage components.

Follow the vehicle manufacturer's specifications for pick-up points and be sure the lift is contacting these areas securely. The pick-up points should be undamaged and free of grease and other substances that might cause slippage.

Some front-wheel drive cars have a support rail in place of a rear axle. This rail allows the use of axle-engaging lifts on front-wheel drive cars. Vehicles with 'stub axles' require wheel-engaging adapters.



C. RUNWAY (DRIVE-ON) LIFTS

Unlike frame and axle-engaging lifts, drive-on lifts pick the vehicle up by its wheels. Some runways on drive-on lifts are not wide enough to accommodate pickup trucks with dual wheels. Check the lift manufacturer's load capacity and runway width specifications **before placing any vehicle on the lift.**

Roll-off Protection

All runway lifts should be equipped with accidental roll-off protection. Once the lift is raised, some approach ramps rise and act as chocks. On lifts where automatic chocks are not provided, use proper manual chocks. The wheel of any vehicle on a runway lift must be chocked while the vehicle is on the lift (see illustration on page 6).

Center of Gravity

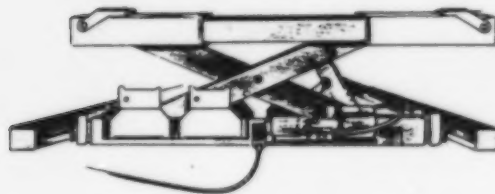
The proper spotting points for vehicles on runway lifts vary depending on the type of lift:

- When hoisting with a single-piston in-ground lift, place the vehicle's center of gravity directly over the piston
- When using a two-piston in-ground lift, place the load's center of gravity on the center line between the two pistons
- When hoisting with a two-column surface-mounted lift, place the vehicle's center of gravity between the two columns
- On four-column lifts, the center of gravity should be placed at the midpoint of the runway.

The single exception to these instructions is in the case of wheel-alignment ramps. In this instance, the front wheels will have to be located on the swivel plates, and the rear wheels on slip plates if provided.

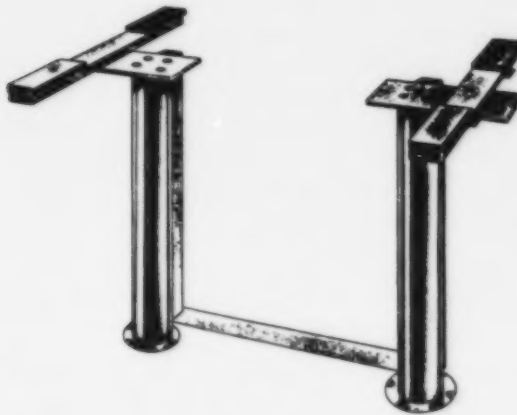
Free-wheeling Jacks

Some manufacturers offer optional air-operated or hydraulic jacks that ride along the inner rails of the two runways. When the lift has this feature, be sure each jack is fully lowered before driving a vehicle on or off the runway. Be sure the contact surfaces are free from corrosion or obstructions and provide a solid lifting surface. Use the vehicle manufacturer's recommended lifting points.



D. RÖCKER PANEL (Pad) LIFTS

Rocker panel lifts are used on passenger cars with unibody construction and perimeter frames. They use padded rubber supports that adjust to different body widths and wheel bases. The car is driven through or over two support members which must then be located correctly to engage the car, either directly or by using special spacer blocks.



Rocker panel or pod lift

The proper spotting points for automobiles used on rocker panel lifts vary, depending on the application. Be sure the pads are firmly contacting the vehicle manufacturer's recommended lift points before raising the vehicle.

LIFTING THE VEHICLE

Once the vehicle is properly spotted, raise the lift until the pads or other supports contact the vehicle. While the lift is in motion, do not block or tie open the lift's controls. **Never leave the controls while the lift is in motion.**

Remember, there should be no one in or near the vehicle. At this point, visually check to see that the supports are contacting the recommended lifting points securely. Raise the vehicle about a foot off the ground. Visually check the lifting points again. If the supports appear to be slipping or are not contacting a flat surface, a lift arm or other support has been incorrectly positioned. Carefully lower the lift and start over.

If a support is not firmly touching a contact point, carefully lower the lift and reposition each support. Unequal weight distribution could cause the vehicle to fall.

Once the load is secure, lift the vehicle to the desired height and visually check those contact points once more before going under the vehicle. Be sure the lift's locking device is engaged and working. If it is not, carefully lower the vehicle, inform the supervisor, and have the lift serviced.

If working under a lift that:

- does not have a locking device or
- is below the point when the locking device engages,

place four jack stands of rated capacity under the vehicle's frame or suspension for support.

Certain features have been installed on the lift to help use the lift safely. Do not override or remove them, and maintain these features so they work as they were designed.



Use four jack stands to equalize and stabilize the load.

MAINTAINING LOAD STABILITY

What happens if there is a sudden shift in the center of gravity? The car could become unstable and fall. The following are some possible causes of a change in the center of gravity.

REMOVING COMPONENTS

Removing major components from front or rear-wheel drive vehicles may cause a radical change in the vehicle's center of gravity. For example, doing automatic transmission work may require a new torque converter and a set of clutches. To service the transmission, it must be removed. That means between 70 - 79 kgs. of bulk is being removed from the vehicle, which will cause a sudden change in the center of gravity.

In addition to transmissions, other major components may cause a shift in the center of gravity if removed:

- engines
- suspension components
- rear axles and differentials
- body and frame components

Be sure to use four jack stands of rated capacity to support the vehicle, to stabilize and equalize the load when removing any of these components. When using jack stands, always adjust stand supports to securely contact the vehicle. **NEVER TRY TO LOWER THE VEHICLE ONTO THE STANDS. DOING THIS DISENGAGES THE LIFT'S LOCKING DEVICES. IF THE LIFT IS LOWERED TOO FAR OR TOO QUICKLY, THE JACK STANDS COULD MOVE, CAUSING THE VEHICLE TO FALL.**

Check the vehicle manufacturer's service manual for recommended procedures when removing vehicle components. These procedures are available from the vehicle manufacturer.

Never use engine or transmission supports or stands in the place of proper rated jack stands. These supports are not capable of supporting the vehicle.

USING CHEATERS

Another common technique that may cause the center of gravity to shift suddenly is torquing or loosening fasteners with a cheater or breaker bar. The sudden pushing or pulling force could cause a vehicle to slip from the lift's supports. The best way to avoid this risk is to tighten and loosen fasteners with an impact wrench.

STORED ENERGY

An unexpected release of stored energy, such as removal of a loaded spring or load-supporting bolt, also can cause components to shift position and alter the center of gravity.

UNEQUAL LOADS

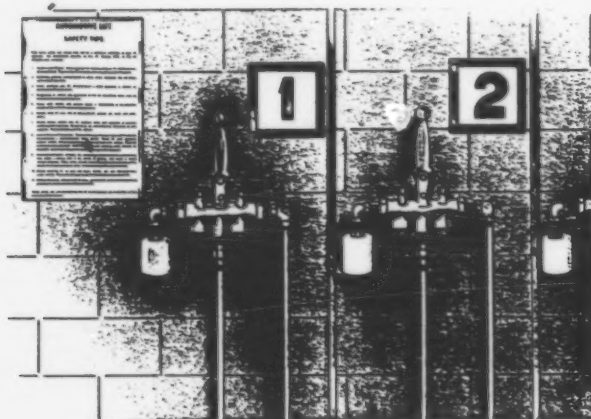
The center of gravity may change dramatically depending on the load the vehicle is carrying (equipment or luggage in the trunk, for example). Use four jack stands to support the unequal load. Be sure the cargo does not exceed the capacity of the lift or will not shift while the vehicle is lifted. **If the cargo is unstable, do not lift the vehicle.**

LOWERING THE VEHICLE

Before lowering the lift, be sure tool trays, jack, engine, and transmission stands, and other obstructions are removed from under the vehicle. Be sure that everyone is clear while lowering the lift. **Never override the instant stop controls on the lift. Always be at the controls while the lift is in motion.**

Before removing the vehicle from the work bay, position lift arms and supports to provide a safe and unobstructed exit. Contact pads should be in their lowest position.

Remember, running over or striking any part of the lift with a vehicle could damage the vehicle and the lift, and affect the safe operation of the hoist.



If the controls for all the lifts in the shop are situated along the same wall, each control should be numbered or marked to identify each unit.

LIFT MAINTENANCE

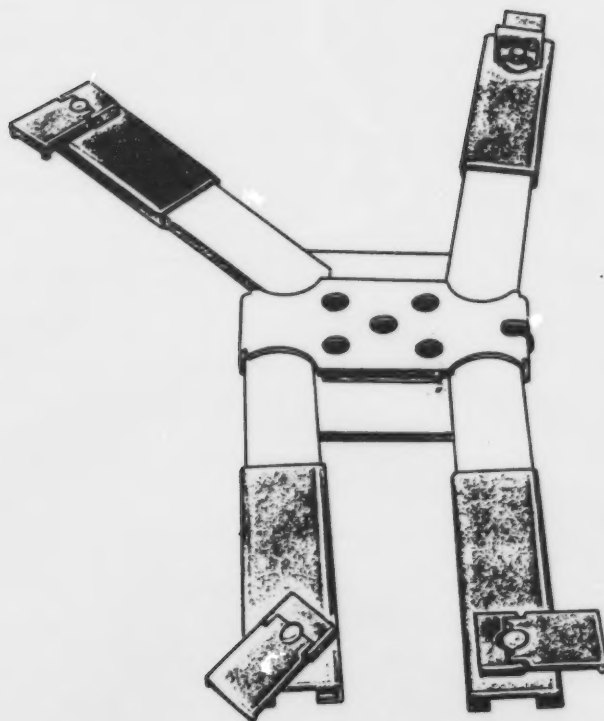
This section will discuss the operation and maintenance of the various moving parts and drive systems of automotive lifts.

Lifts should be inspected on a daily basis and a record of the inspection kept in a log book. If the lift malfunctions or is damaged, **do not use it**. Repairs must be made by qualified lift service personnel.

TELESCOPING LIFT ARMS

Telescoping lift arms are used mainly on frame-contact lifts. As the name implies, they are adjustable in order to accommodate different vehicle types and sizes. To maintain the lift arms:

- check the over-travel stops for wear
- watch for stress cracks or breaks in welds and castings
- examine arms for permanent bending
- lubricate swivel points
- never heat and/or re-bend damaged arms or weld cracks
- do not attempt to modify the lift with unapproved components
- inspect all lift adapters and extenders before using them
- replace defective parts with those approved by the manufacturer



Maintain lift arms periodically.

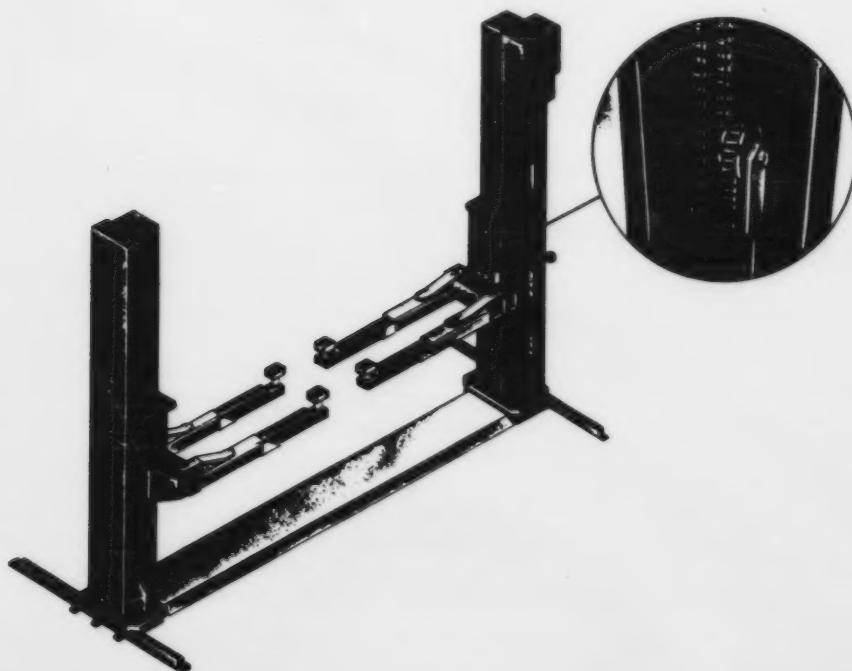
CHAINS AND CABLES

Chains and cables are used mostly on surface-mounted lifts as a means of lifting and synchronization. Chains and cables are also used to synchronize the movement of pistons on some in-ground lifts. Here are some important maintenance tips:

- Check chains and/or cables for unusual stretch or wear.
- Lubricate chains and cables.
- Inspect end connections for corrosion or fatigue, excessive wear, connection hole elongation, or deformation.
- Check sprockets and pulleys for wear and damage. They must roll freely. Keep them lubricated.
- Examine coatings and sheaths on cables for wear.
- If there are slack sensors, be sure they are working correctly
- Keep salt, sand, water, dirt, and other debris away from the lift. Rust can work its way into piston housings, lift columns, chains, cables, and bearings and obstruct the lift.
- All worn or damaged parts must be replaced with the manufacturer's approved equipment by qualified lift service personnel.

Have the chain system serviced if:

- there is excessive wear on links, pins, guides, sprocket sides
- there is an increase in slack
- end connections are suspected of damage or wear
- chains are deformed, bent, rusted, or broken
- chains are contaminated with foreign materials



Have the cables replaced if:

- the cable is deformed, kinked, corroded, or excessively worn
- there are any broken, cut, bent, or crushed wires
- the cables become unstranded
- the cable is contaminated with foreign materials
- the end connections are damaged or worn
- there is a sudden increase in slack

AIR/OIL SYSTEMS

When under pressure, air can be dangerous. The main points to remember when working with air/oil (full or semi-hydraulic) lift systems are:

- Do not 'tie down' or override the air or control valves. Always be at the controls when the lift is in motion.
- Always exhaust pressure valves completely before inspecting or maintaining the lift. Maintenance should be performed using proper lock and tag-out procedures. All stored energy must be exhausted before starting.
- Comply with the manufacturer's recommendations for checking and adding hydraulic oil to a unit. If the lift vibrates or operates erratically while operating, it could be an indication of an oil leak.

- Before removing the fill plug, re-check to be sure the air valve is in the exhaust position and all air from the tank is released. Remove fill plugs slowly and carefully with a manual wrench. **DO NOT USE IMPACT TOOLS TO REMOVE FILL PLUGS.** Removing the plug too quickly could cause it to release instantaneously if the system is under pressure.

If the lift is equipped with a low oil control, be sure it's operating properly. If there is reason to believe it is not, stop using the lift until it is serviced.

Use caution when removing other plugs, fittings, and connections. Follow the lift manufacturer's instructions for bleeding pressure valves and fittings and for checking hydraulic oil. If there is any escaping air or liquid seeping around the plug, **STOP IMMEDIATELY** and release the stored pressure in the system.

- Keep filters and magnets clean.
- Check seals, packings, and wipers periodically.
- Make sure the return lines to the reservoir are tightly connected and aren't leaking or damaged.
- Watch for blow-by and oil leaks in the cylinder housing, and check for damage in the piston rod or plunger.
- Have qualified lift service personnel install and repair air and oil lines.

SOIL CONDITIONS

There are certain conditions that should be monitored if the shop uses in-ground lifts. Water and various soils have the potential to corrode metal. Inspect the integrity of the pistons and other components. If any defects are noticed, the lift should not be operated until it's repaired.

Corrosion may also affect the hydraulic oil tank and oil lines if they are underground. If leaks occur, contamination to local soils and ground water supplies could result. Check the lift's oil level regularly. If any amount of oil has to be added to the lift, a leak may exist.

SURFACE-MOUNTED SYSTEMS

Most surface-mounted lifts use electrically powered hydraulic cylinder(s) or screw-type drives. The main concerns when operating these systems include:

- Not overloading the motor's rated load capacity. The manufacturer's rated load capacity is displayed on the nameplate attached to the lift. If the nameplate is missing, check the manufacturer's service manual. **Do not operate the lift without this vital information.**
- Maintaining gear boxes, v-belt, or timing belt drives, if any.
- Checking, cleaning, maintaining, and lubricating drive screw and nut systems on screw-type lifts.
- Making sure the safety (follower) nut is working properly on screw-type lifts. Check the manufacturer's maintenance and operations manuals for proper use.
- Maintaining hydraulic oil level in the unit. It should be checked periodically to comply with the manufacturer's specific maintenance schedules.
- Having a qualified lift service company replace components.

SPECIAL LOAD-BEARING COMPONENTS

Follow the manufacturer's instructions for checking and lubricating load bearings, rollers, and slide blocks. Also refer to the manufacturer's recommendations for checking and torquing floor bolts and superstructure connectors.

FLOOR QUALITY

Most surface-mounted lifts require special concrete foundations. Check the lift area each day for any cracks or loose concrete around the mounting bolts. If there are any flaws, don't use the lift. Notify the supervisor immediately. Do not allow anyone to use the lift until the condition is repaired.

Also check the mounting bolts for tightness. If they're loose, tighten them (with the lift in its fully lowered position) to the manufacturer's specifications.



PERSONAL PROTECTIVE EQUIPMENT

In accordance with the regulations adopted under the Workplace Safety and Health Act, W210, the employer is required to equip all workers with suitable personal protective equipment. This may include safety eye and facewear, headwear, footwear, hearing protection and proper protective clothing.

Safety eyewear and face protection is to be worn to protect the eyes from rust, sparks, engine coolant, and other substances that might fall from the bottom of a vehicle or become airborne due to the work process.

C.S.A. approved safety shoes with slip-resistant soles must be worn to protect feet from falling objects and slipping and tripping hazards like transmission fluid and other lubricants.

Protective headwear is worn by service technicians in the automotive industry to protect the head against protruding objects, like sharp body seams, bolt ends, and falling objects. Appropriate gloves should be worn to protect the hands against heat and flying torch sparks, sharp edges, and rusted or broken parts.

If the job involves using noisy tools like air chisels and impact tools, hearing protection must be worn.